The Mainz Pouch II has now been used widely and found to be a valuable addition to the various types of urinary diversion. The authors from Mainz describe how a colonic conduit can be converted into a Mainz Pouch II, and the expected outcome from such a procedure.

Conversion from colonic conduit into recto-sigmoid pouch (Mainz pouch II)

SASCHA PAHERNIK, CHRISTOPH WIESNER, ROLF GILLITZER, RAIMUND STEIN and JOACHIM W. THÜROFF

Department of Urology and Paediatric Urology, Johannes Gutenberg University, School of Medicine, Mainz, Germany

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OBJECTIVE

To report our long-term results of conversion from conduit conversion into a continent anal urinary diversion, as after conduit urinary diversion in childhood, some patients wish to have a later conversion to a continent diversion to avoid external appliances and to improve their quality of life.

PATIENTS AND METHODS

Between 1992 and 2003, 139 patients had a urinary diversion with a recto-sigmoid pouch (Mainz pouch II), of whom four had a conversion from a colonic conduit diversion to a recto-sigmoid pouch. The mean (range) age at conduit diversion was 5.5 (3–14) years and the mean interval between conduit diversion and conversion to a continent anal diversion was 8 (4–18) years. The mean age at conversion into a Mainz pouch II was 13 (8–32) years and the follow-up afterward was 11.5 (1–13) years. The conversion was done by incorporating the pre-existing colonic conduit into the recto-sigmoid pouch with no ureteric reimplantation.

RESULTS

There were no early complications; one nephrectomy was required 5 years after conversion because of uretero-intestinal obstruction and pyelonephritis. All other reno-ureteric units remained stable and renal function was maintained. All patients are continent day and night; three require substitution with alkali at a base excess of <−2.5 mmol/L to prevent hyperchloraemia and acidosis.

CONCLUSION

The recto-sigmoid pouch is a therapeutic option when patients desire conversion from an incontinent type of urinary diversion to a continent type.

KEYWORDS

continent anal urinary diversion, conversion, colonic conduit, recto-sigmoid pouch

INTRODUCTION

In the past, conduit urinary diversion was commonly used for supravesical diversion in children with irreversibly damaged or diseased bladders [1,2]. However, pitfalls of conduit diversion include stoma-related complications such as stoma stenosis and dermatitis, and renal deterioration from ureteric obstruction or reflux [3–5]. Due to developments in the field of continent urinary reservoirs in the past 20 years, continent cutaneous diversion [6–8] and continent anal diversion [9,10] have become options when orthotopic bladder substitution is not possible. Specific advantages such as an improved body image and a more independent lifestyle without external

TABLE 1 Patients with conversion from colonic conduit into recto-sigmoid pouch

	Patient			
Variable	1	2	3	4
Gender	F	M	F	M
Diagnosis	Bladder exstrophy	Bladder exstrophy	Incontinent epispadias	Neurogenic bladder
Surgery before CCD (age, years)	Nephroureterectomy (0) Ureterocutaneostomy (0) Cystectomy (2)	Primary closure (1)	Ureterosigmoidostomy (3)	None
Age, years (year):				
at CCD	7 (1986)	4 (1988)	14 (1974)	3 (1994)
at conversion	13 (1992)	8 (1992)	32 (1992)	11 (2002)
Surgery at/after Conversion (age, years)	Ileocaecal neovagina (15)	Genital reconstruction (14) Urethral reconstruction with buccal mucosa (16)	Nephrectomy (35) Hernia repair (40)	None
Complications	None	None	Pyelonephritis (35) Hernia (40)	None

CCD, colonic conduit diversion.

appliances seem to justify these more complex procedures.

Ureterosigmoidostomy represents the oldest form of continent urinary diversion [11], but it fell into disfavour due to complications such as pyelonephritis and renal function impairment, anal incontinence and metabolic acidosis. Peristaltic contractions of the sigmoid colon causing increased pressure were held responsible for anal incontinence and sigmoido-ureteric reflux. The recto-sigmoid pouch (Mainz pouch II) successfully overcame these disadvantages [9]. The main advantage of the Mainz pouch II is detubularization and reconfiguration of the recto-sigmoid colon, resulting in a low-pressure reservoir. Consequently, the continence rate was improved while reflux and pyelonephritis were largely prevented [9].

We report our experiences of converting the diversion in patients who had a conduit urinary diversion in childhood for bladder exstrophy, incontinent epispadias and neurogenic bladder, to a continent anal urinary diversion. In young patients with benign diseases and having a normal life-expectancy, the long-term consequences of conversion into a continent rectal reservoir are of paramount interest.

PATIENTS AND METHODS

Between 1992 and 2003, 139 patients had a urinary diversion using a recto-sigmoid pouch (Mainz pouch II), among whom were four who had conversion from a colonic conduit diversion. Their mean (range) age at primary conduit diversion was 5.5 (3–14) years, the mean interval between conduit diversion and conversion into continent anal diversion 8 (4–18) years and the mean age at conversion into a Mainz pouch II was 13 (8–32) years. The characteristics of the patients are summarized in Table 1.

Before conversion a conduitogram was taken in all patients to exclude reflux. Impaired renal function and an incompetent anal sphincter were contraindications for conversion to a recto-sigmoid pouch. The recto-sigmoid pouch was a slight modification of the Mainz pouch II [9]. Briefly, the colonic conduit with the antirefluxive implanted ureters is detached from the abdominal wall, its mesentery is mobilized and the conduit is pulled through the mesenteric window of the descending colon and opened antimesenterically. The recto-sigmoid is mobilized and arranged in an inverted U-shape. The anterior aspect is opened along the taenia libera for detubularization. The posterior pouch wall is created by side-to-side anastomosis of the margins of the split rectum and sigmoid colon. Next, the colonic conduit is incorporated into the pouch forming the anterior wall (Fig. 1). As all ureters were not refluxing, the uretero-intestinal anastomoses remained untouched in all patients. To avoid postoperative changes of position of the pouch with subsequent kinking of the ureters, the reservoir is fixed by sutures to the promontory.

The follow-up studies included assessing the upper urinary tract ultrasonographically, renal function, serum electrolyte levels and acid-base balance. Renal function was studied by MAG-3 renography. The acid-base balance was determined from capillary blood gas analysis. Data are given as the median (range) unless otherwise specified. The mean follow-up after conversion into a recto-sigmoid pouch was 11.5 (1–13) years.

RESULTS

Four patients had a conversion from a colonic conduit to a recto-sigmoid pouch between 1992 and 2003; there were no perioperative complications. All patients are completely continent day and night. The mean voiding frequency during the day was 6 (5–8) and during the night 1 (0–2). The upper urinary tract remained stable in six of seven reno-ureteric units. One patient (number 3, Table 1) before surgery had a moderate to severe dilatation of her right kidney, which contributed 27% to the total renal function, but had no ureteric reimplantation at the time of conversion and after surgery developed progressive hydronephrosis, recurrent pyelonephritis and reduction of the split function of her kidney to 19%. Five years after conversion, following the patient's wishes, she had a nephrectomy. All remaining renal units had renographically stable kidney function.

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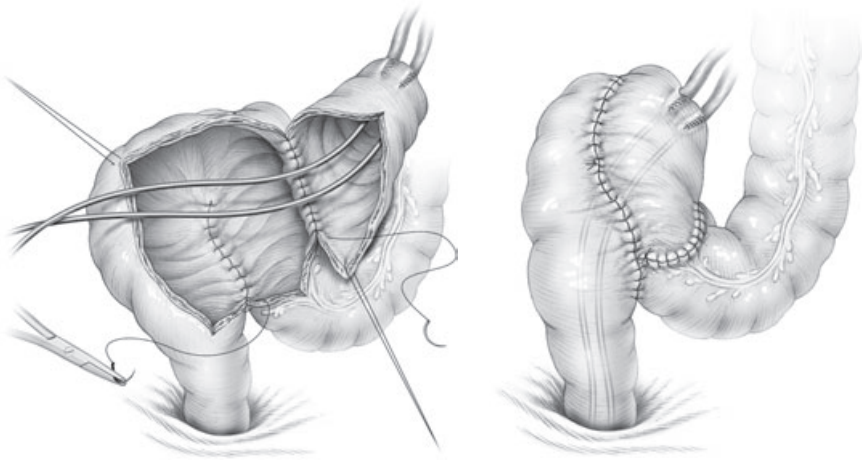
FIG. 1. Conversion of a colonic conduit into a recto-sigmoid pouch (Mainz pouch II, 12).The lower sigmoid colon and proximal rectum are mobilized and arranged in an inverted U-shape. The anterior aspect is opened along the taenia libera for detubularization. The posterior pouch wall is created by side-to-side anastomosis of the margins of the split rectum and sigmoid colon (A). The colonic conduit is incorporated into the pouch forming the anterior wall (B).

A B



The mean serum creatinine levels at the follow-up were 0.72 (0.39–0.81) at 1 year (four patients), 0.84 (0.80–0.88) at 5 years (three) and 1.01 (0.74–1.10) mg/dL at 10 years (three).

The acid-base balance was assessed by calculating base excess from capillary blood gas analysis. Clinically, at a base excess of <−2.5 mmol/L, alkalizing substances were routinely administered to prevent hyperchloraemic acidosis; three patients required alkali substitution. The mean base excess at the 1-, 5- and 10-year follow-up was −1.1 (− 5.7 to 1.8) (four patients), −1.1 (−2.6 to 1.4) (three) and −0.9 (− 2.9 to −0.7) mmol/L (three). The respective serum chloride values at the follow-up were 104 (101–112), 106 (103–111) and 106 (98–107) mmol/L. Other electrolytes, e.g. sodium, potassium and calcium, were in the normal range during the follow-up; no patient developed clinical acidosis.

To check for tumour development at the uretero-intestinal anastomosis, we routinely requested annual recto-sigmoidoscopy starting at 10 years after surgery; this was available in three patients. In one patient, a polyp at the uretero-intestinal anastomosis, with no signs of malignancy on histopathology, was removed 11 years after primary conduit diversion and 10 years after conversion into a Mainz pouch II.

DISCUSSION

This retrospective analysis comprises four cases of conversion of a paediatric colonic-conduit into a continent anal urinary diversion (Mainz pouch II), a modification of the classical ureterosigmoidostomy. Detubularization and reconfiguration of the recto-sigmoid segment reduces the frequency and amplitude of contractions [12] resulting in a low-pressure, high-capacity reservoir, thus improving continence and reducing the risk of pyelonephritis and antiperistaltic reflux of urine [13,14]. From the surgical perspective conversion of a colonic conduit to a recto-sigmoid pouch is straightforward, obviating the need to create an intestinal anastomosis and a continence mechanism. When a nonrefluxing colonic conduit is incorporated, the uretero-intestinal anastomosis does not usually need revision, as was the case in all four patients. Compared to conversion into a continent cutaneous urinary diversion, the procedure is less demanding and time-consuming. A high capacity with low pressures [9] and low complication rates [15] make the recto-sigmoid pouch an attractive alternative to other forms of continent urinary diversion. A similar, more complex solution was proposed by Mansi [16], converting colon and ileal conduit diversion into a recto-sigmoid reservoir. The rectal reservoir used was the valved and augmented rectum and the valved S-shaped rectosigmoid pouch. The ureters were reimplanted into an intussusception ileal nipple valve while the conduit was used for augmentation of the rectum [16].

Patients' satisfaction with this type of urinary diversion is usually high [14]. Independence from appliances such as external collecting devices and catheters favour this type of diversion from the patients' view. There is no risk of a rupture compared with other continent urinary diversions. As with orthotopic bladder substitution, the lack of a cutaneous stoma is regarded as beneficial in terms of the patient's body image. A stoma-free type of urinary diversion is also particularly important in countries where, for economic and/or logistical reasons, it is difficult to provide a sufficient supply of collecting devices and catheters, and to have access to enterostomal therapists.

Metabolic disturbances are a consequence of incorporating any segment of the bowel into the urinary tract. An impaired renal function predisposes to metabolic complications after urinary diversion. Therefore, serum creatinine levels of >2 mg/dL are a contraindication for urinary diversion by a recto-sigmoid pouch. We regularly monitor the acid/base balance; at a base excess of <−2.5 mmol/L we give oral alkalinizing agents such as potassium/sodium citrate. The proportion of patients who require alkalizing agents is 70% in those with a Mainz pouch II [12]. Early medical intervention for balancing a base deficit prevents clinical metabolic acidosis.

One of the major concerns in ureterosigmoidostomy is the development of malignancy at the site of uretero-intestinal anastomosis. The issue of secondary malignancy is of less relevance for older patients undergoing urinary diversion after cystectomy for cancer. However, in children with a normal life-expectancy, the risk of developing malignancy is of major concern. Therefore, meticulous endoscopic surveillance is required after using recto-sigmoid reservoirs in children for urinary diversion, to identify any tumour at the uretero-intestinal anastomosis early and before malignancy develops. For the early detection of uretero-intestinal tumours, annual endoscopy is recommended to start from 10 years after surgery [17].

In conclusion, the recto-sigmoid pouch is a valid therapeutic option when patients desire

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conversion from an incontinent type of urinary diversion into a continent type. As for this type of urinary diversion, continence and a better body image can be achieved while renal function and metabolic balance can be maintained. However, lifelong surveillance is mandatory for the early identification of intestinal tumours.

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CONFLICT OF INTEREST

Joachim Thüroff is an Associate Editor for *BJU International*.

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Correspondence: Sascha Pahernik, Department of Urology, Johannes Gutenberg University, Langenbeckstraße 1, 55101 Mainz, Germany.
e-mail: Pahernik@urologie.klinik.uni-mainz.de

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